

TECHNICAL MANUAL
CALIBRATION PROCEDURE
FOR
MAINTENANCE DATA COLLECTION CODES
AND
CALIBRATION MEASUREMENT SUMMARIES

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SECTION 1

INTRODUCTION

1.1 PURPOSE AND SCOPE.

This Technical Order (TO) is to be used with TO 33K-1-100-2 as a guide for determining calibration responsibility, Work Unit Code assignment, Calibration TO, and calibration interval for Test, Measurement, and Diagnostic Equipment (TMDE) and other Support Equipment (SE). It applies to all work centers possessing TMDE. Items are listed by model number, type number, part number, drawing number and Military Specification (MIL-SPEC) number in alphanumeric order. All Calibration Interval listings are in months. See Section 7 for details on TO 33K-1-100-2 distribution through the Air Force Calibration Authority Viewer (AFCAV).

1.2 GENERAL.

Calibration responsibility and applicable TOs for TMDE are listed in TO 33K-1-100-2 and weapon system Calibration Measurement Summaries (CMSs). See Section 4 of this TO for applicable CMS.

- a. If a new item of TMDE cannot be supported using the guidelines of this TO and TO 00-20-14, the calibration responsibility, applicable TO reference, and Work Unit Code (WUC) will be obtained by the Precision Measurement Equipment Laboratory (PMEL) Chief by submitting an AFTO Form 45 in accordance with (IAW) TO 00-20-14, except as indicated in Section 3-1 of this TO.

(1) Requests for changes to the following fields of TO 33K-1-100-2 index are considered minor changes:

1) Part number, 2) Nomenclature, 3) Calibration Responsibility and 4) WUC. Minor K100 changes should be submitted via e-mail. Minor K100 changes for electrical items should be sent directly to the appropriate 562 CBSG Technical Content Manager (TCM) or to AFMETCAL.K100.ELEC@afmetcal.af.mil; minor changes for mechanical items should be sent directly to the appropriate 562 CBSG TCM or to AFMETCAL.K100.MECH@afmetcal.af.mil. The categories of electrical and mechanical items can be found by following the "E-mail minor changes to the K100" hotlink on the TO Support page of the 562 CBSG METWEB site.

(2) Requests for changes to the following fields of TO 33K-1-100-2 index may be minor or major depending on the nature of the change: 1) TO number field, and 2) Calibration interval field. Changes to these two fields shall be submitted by the most cost-effective method available. The order of precedence is as follows:

1) e-mail message submitted to the appropriate TCM, 2) e-mail message submitted to: AFMETCAL.K100.ELEC@afmetcal.af.mil or AFMETCAL.K100.MECH@afmetcal.af.mil, whichever is appropriate, 3) letter, 4) message, or 5) AFTO Form 22.

(3) Requests for typo or administrative changes to TO 33K-1-100-1 (text part) are considered minor and shall be submitted by letter, message, or e-mail message submitted to: AFMETCAL.K100.1@afmetcal.af.mil. Requests for policy changes to TO 33K-1-100-1 shall be submitted by the most cost-effective method available. The order of precedence is as follows: 1) e-mail message submitted to: AFMETCAL.K100.1@afmetcal.af.mil, 2) letter, 3) message, or 4) AFTO Form 22.

- b. Calibration responsibility or TO requests submitted by all activities, including DOD and contractor agencies, will include as an attachment technical data, manufacturers handbooks or any commercial data indicating specifications, accuracies, ranges, and parameters of the equipment. Calibration determination and/or preparation of a calibration procedure will not be accomplished unless data is furnished with the request. All data furnished should be plainly marked with the return address. After action is completed, the data will be returned to the originator.

c. Requests for determining calibration responsibility and/or the applicable TO will not be submitted for:

(1) Equipment part numbers having options that are subsets of a part number already listed. For example, a determination request would not be submitted on part number 123OPT001 if part number 123OPT001-002 is already listed.

(2) Options such as the following where parameters are the same as the original equipment and a 33K-series TO exists.

- (a) Rack mount options (R at the end of a part number, OPT-908, etc.).
- (b) Warranty options (OPT-W30, OPT-W55, etc.).
- (c) Service Manuals.
- (d) Front Handle Kits (OPT-907 etc.).
- (e) Rear Panel Connectors unless the option changes the equipment specifications.
- (f) Connector Type options unless the option changes the equipment specifications.
- (g) Cable length or No Cable Options unless the option changes the equipment specifications.
- (h) IEEE Bus connector.
- (i) Calibration Data (OPT-890, etc.).
- (j) Shipping Instruction Options.
- (k) Options that provide extra Probes.

(3) Equipment part numbers already covered by a SERIES entry in the TO 33K-1-100-2.

(a) A SERIES entry in the TO 33K-1-100-2 is a conscious effort to consolidate like items and reduce the number of entries in the TO 33K-1-100-2. SERIES entries will be used to identify equipment part numbers containing characters used by the manufacturer to designate or identify features of the product when those features do not affect the calibration uncertainty of the original equipment. If the manufacturer's literature for the item in question uses Options to specify additional features, the SERIES entry is not applicable to the item.

(b) The features to be included in a SERIES entry are similar to the excluded options listed in para 1.2.c.(2) above (i.e. rack mount, warranty, size, case style, etc.).

(c) Entries will appear in the TO 33K-1-100-2 as the base part number followed by the word SERIES (for example E SERIES, 100 SERIES, A12 SERIES, etc.).

(d) When receiving an item for the first time, the following should be accomplished to determine if a SERIES entry may be used or if a Calibration Determination Request (AFTO Form 45) shall be submitted:

(1) Look up the part number as identified on the unit in the applicable CMS and TO 33K-1-100-2. If a listing for the item is found, STOP - no Calibration Determination Request (AFTO Form 45) is required. If a listing was not found, go to (2).

(2) Look in the TO 33K-1-100-2 to see if the item is identified with the base part number followed by SERIES. If a SERIES entry is found verify that the manufacturer and noun match the item in question. If these match, go to (3). If they do not match - submit a Calibration Determination Request (AFTO Form 45).

(3) Locate the 33K series TO identified as the calibration authority for the SERIES entry. Ensure that the 33K series TO Table 1 specifications encompass the specifications of the item in question. If the specifications are in agreement, STOP - the SERIES entry may be used and no Calibration Determination Request (AFTO Form 45) is required. If the specifications are not in agreement - submit a Calibration Determination Request (AFTO Form 45).

(4) When multiple part numbers appear on a unit and are also listed in TO 33K-1-100-2, the hierarchy for which part number to use is as follows:

- a) Manufacturers part number.
- b) Government assigned part number.
- c) Military assigned part number.

NOTE

When the TI is a kit or part of a test stand, apply this hierarchy to the complete assembly. For example: an aircraft tire kit, P/N 1064 is a P/N 1064 when all components are original. If a calibrated part is replaced with a different manufacturers part number the most accurate part number for the complete assembly becomes MILG8348().

This intent is to maintain the system specifications of the complete assembly. Using individual part numbers may result in over/under specification.

For complex test stations, an AFTO Form 45 may be required to accurately SICL the test station.

For items that have two or more part numbers (manufacturer, military or government assigned), not all of which are listed in TO 33K-1-100-2, an AFTO Form 45 may be submitted for the unlisted part number(s). In the AFTO Form 45 remarks section clearly state the part number that is listed in TO 33K-1-100-2 so that the additional (unlisted) part number(s) can be properly referenced.

(5) Items designated MIL may have more than one manufacturer. If this is the case, the calibration responsibility and/or 33K-series TO indicated in TO 33K-1-100-2, Calibration Requirements List, will be used regardless of the manufacturer. If the item is identified by MIL number and part number, the part number will take precedence.

(6) Calibration responsibility for locally manufactured test and calibration aids; i.e., jigs, fixtures, adapters, loads, etc., will be determined jointly by the User and PMEL Chief. Items within this category identified as not being TMDE will not require TMDE related certification or noncertification Labels. Conflicts in determinations will be submitted to 562 CMSG IAW para 1-2a.

(7) Items designated as Automatic Data Processing Equipment (ADPE) are not considered TMDE and will not be listed in TO 33K-1-100-2.

d. New equipment entering the Air Force inventory may require calibration, see TO 00-20-14 and review para 3.1 of this manual for guidance. Some equipment may require calibration methods similar to those used for items covered by existing 33K-series TOs. This equipment may not operate in the same ranges or parameters as those outlined in the existing TO. Activities requesting calibration determination should try using the appropriate TO and advise 562 CMSG if the techniques are satisfactory or if there are recommended changes. This will aid 562 CMSG in preparing revisions or new TOs. If an existing 33K-series TO is used, commercial data would still be the authority used until the equipment can be included in TO 33K-1-100-2 (Equipment Calibration Requirements List).

Items listed in TO 33K-1-100-2 are not necessarily identified in the heading of the applicable TO. However, TO 33K-1-100-2 (Equipment Calibration Requirements List) identifies the applicable TO that will be used for accomplishing the calibration. If a published TO contains more than one set of accuracy specifications, the applicable specification will be identified in the NOMENCLATURE column by the abbreviation SSA (Same Specifications As).

e. The Air Force Primary Standards Laboratory (AFPSL) has facilities, equipment, and personnel to perform calibrations in special branches of the metrology science such as photometry, infrared, ultraviolet, and other applications of the electro-magnetic spectrum. This capability permits technical evaluation of equipment and its characteristics, resolution of technical problems, evaluation of techniques, and establishment of procedures for special application calibration support. The information required to establish a specific plan of calibration support is not always available at the time that special systems are introduced into Air Force inventory. PMEL representatives will contact 562 CBSG (see para 1-2a) whenever support is required in any of the special applications. Interim procedures will be developed to be used for the required support. The following will be provided:

- (1) Identification of TMDE and reference usage and requirements for calibration support.
- (2) Determination of measurement parameters and applicable tolerance requirements.
- (3) Determination of techniques and procedures to be used to accomplish the calibrations.
- (4) Assurance that there is a single point of contact with the National Institute for Standards and Technology (NIST), traceability and standardization, and compatibility with the Air Force calibration program.
- (5) Evaluation of equipment capability to provide desired information.
- (6) Resolution of technical problems and assistance to personnel concerned with the special application calibration.
- (7) Determination of the feasibility of and provisions for the exchange of standards.
- (8) Determination of equipment to be calibrated at the AFPSL and scheduling of equipment to the laboratory.

f. TMDE listed in TO 33K-1-100-2 and CMSs has a Change Code (CC) field with a code that corresponds to the latest action or status of each entry. Change codes are listed in Table 1-1 below. Entries identified by a "D" code are valid entries, but will be deleted from the next publication of this TO unless requirements for retention are identified to 562 CBSG.

Table 1.1 CHANGE CODES

Action	Code
added	A
automated TO being written	S
changed	C
not changed	N
scheduled for Deletion	D
changed from NCR to scheduled Cal Int	P
TO being written	T

g. Maintenance TOs are not normally listed in TO 33K-1-100-2. Official guidance to identify Maintenance TOs are provided in USAF TECHNICAL ORDER CATALOG, <https://www.toindex-s.wpafb.af.mil/>.

1.3 ANALOG TI RESOLUTION.

Unless otherwise directed by the item specific calibration authority, if the TI resolution is such that the manufacturers stated accuracy cannot be realized, the TI shall be limited to the "next greater $\frac{1}{2}$ division". This only applies when the TI reading is outside of the nearest $\frac{1}{2}$ division less than the stated accuracy. If during calibration, the TI is found to be within the nearest $\frac{1}{2}$ division less than the stated accuracy, the TI need not be limited.

NOTE

Provided the dial can be read to $\frac{1}{2}$ division, otherwise the gage is limited to the next greater division. An example when a gage cannot be read to $\frac{1}{2}$ division is when the gage pointer is the same width as the distance between the gage division marks.

A limitation is not required if the TI is calibrated by adjusting the Standard for exact cardinal points on the TI, the indications are taken from the Standard, and the Standard (i.e. digital standard) used for the calibration has the resolution required to fully certify the TI.

Example: A 700 psi gage has an accuracy of 2.5% FS and is scaled in 10 psi divisions. The accuracy converts to 17.5 psi, which for this gage is $1\frac{3}{4}$ divisions. The standard is set to 200 psi, and the TI reads between 185 to 215 psi, i.e. within $1\frac{1}{2}$ divisions. The gage is not limited. If the gage reads outside of 185 to 215 psi the gage is limited to the next higher $\frac{1}{2}$ division than the reading, e.g., if the gage reads between 215 to 220 psi the gage is limited to the next higher $\frac{1}{2}$ division i.e. to ± 2 divisions. Provided the dial can be read to $\frac{1}{2}$ division, otherwise the gage is limited to the next greater division. An example of when a gage cannot be read to $\frac{1}{2}$ division is when the gage pointer is the same width as the distance between the gage division marks

SECTION 2

MAINTENANCE DATA COLLECTION CODES

2.1 GENERAL.

The Maintenance Data Collection (MDC) system codes contained in this TO are primarily for recording calibration and repair actions performed by Precision Measurement Equipment Laboratories (PMELs) on Test, Measurement and Diagnostic Equipment.

2.2 SECURITY.

When maintenance is being performed on classified equipment, the listing of a Work Unit Code could possibly lead to a breach of security, such as betrayed mission capability. Extreme caution should be exercised and, if any question exists, contact your local Operations Security Program Manager (OPSEC PM).

2.3 CHANGES TO CODES.

Recommended changes to this TO regarding the Type Maintenance, Action Taken, When Discovered, or Work Unit Codes (WUC)s shall be submitted by the most cost-effective method available. The order of precedence is as follows: 1) e-mail message submitted to: AFMETCAL.K100.ELEC@afmetcal.af.mil, 2) letter, 3) message, or 4) AFTO Form 22.

2.4 USE OF CODES.

It is necessary to use codes for recording PMEL actions into the MDC system. That data is entered into the PMEL Management Information System such as PAMS. The collected MDC data is used to produce reports in support of various management functions such as setting and adjusting calibration intervals for TMDE. It is important that all codes entered are accurate. The calibration intervals set as a result of these inputs are accurate only if the inputs are accurate.

- a. The Standard Reporting Designator (SRD) consists of three alphanumeric characters and is used to identify equipment for MDC purposes. Typical PMEL used SRDs are "HPA" (Air Force TMDE), "HTE" (Air Force Equipment used in resident training) or "HPB" (non Air Force TMDE).
- b. The Work Unit Code (WUC) consists of five characters. The WUCs listed in TO 33K-1-100-2 will be used for TMDE for which the PMEL has the calibration and repair responsibility. Otherwise, the applicable WUC tables will be utilized. Table 3.2 lists the General WUCs used by the PMEL.
- c. The Type Maintenance Codes, defined and listed in Table 2.1, consist of one alphabetic character and are used to identify the type of maintenance being performed.
- d. The When Discovered Codes defined and listed in Table 2.2, consist of one alphabetic character and are used to describe when the discrepancy or maintenance requirement was discovered.
- e. The Action Taken Code, Calibration Condition Received, and Calibration Condition Returned codes, defined and each listed in Tables 2.3, 2-4a, and 2.4b respectively, each consist of one alphabetic or numerical character and taken together are used for calibration interval analysis

NOTE

The *combination* of accurate Action Taken, Calibration Condition Received and Calibration Condition Returned Codes as recorded in the Maintenance Data Collection system is very important. The *combination* of these three fields is used for calibration interval analysis. Appendix A of this TO lists valid combinations of Action Taken, Calibration Condition Received (by the PMEL), and Calibration Condition Returned (to the owner) Codes. (A user-friendly version of the matrix of the three field combinations is available on the AF Portal Metrology and Calibration Functional Area, Customer Support page to help with proper application of the three field combinations). Once the Action Taken Code is selected, the selection of Calibration Condition Received Codes should be restricted. Once the Action Taken and Calibration Condition Received Codes are selected, the selection of Calibration Condition Returned Codes should be further restricted.

Example: If the Action Taken Code is K (Calibrated --Adjusted), the Calibration Condition Received Code is A (In Tolerance), and the Calibration Condition Returned Code is G (In Tolerance), we deduce that a minor adjustment (peak or tweak) was performed, but the item was within tolerance at the start of the calibration.

Collectively, the Work Unit Code, Action Taken Code, Calibration Condition Received code, and Calibration Condition Return code identify a unit of work.

f. The War Readiness Material (WRM) Codes defined and listed in Table 2.6 are assigned to each item in the PMEL inventory. The One-Digit Code identifies the status of each item as WRM, Deployed or not belonging in either category.

Table 2.1 TYPE MAINTENANCE CODES FOR TMDE.

TYPE MAINTENANCE DESCRIPTION	CODE
SERVICE. Includes all units of work associated with servicing, cleaning and movement of equipment that is not accomplished concurrently with Type Maintenance Codes B, J, S or T.	A
UNSCHEDULED MAINTENANCE. Includes all unscheduled maintenance, inspection, calibration, repair and servicing performed between calibration intervals.	B
SCHEDULED CALIBRATION OF EQUIPMENT OR COMPONENTS. Includes all units of work accomplished concurrently with a scheduled calibration.	J
SPECIAL INSPECTION. Includes all units of work accomplished during all phases of special inspections, excluding accomplishment of TCTOs.	S
TIME COMPLIANCE TECHNICAL ORDER (TCTO). Includes accomplishment of all TCTOs.	T

Table 2.2 WHEN DISCOVERED CODES

WHEN DISCOVERED DESCRIPTION	CODE
During Equipment Operation/Caused Equipment Down Time	C
During Equipment Operation/Did Not Cause Equipment Down Time	D
Unscheduled Maintenance	F
Daily Inspection/Shift Verification	J
Scheduled Inspection (Not Communications-Electronic Maintenance)	M
Operational System Check	P
Special Inspection	Q
Quality Control Check	R
Depot Level Maintenance	S
During Scheduled Calibration	T
Non-Destructive Inspection, includes optical penetrant, magnetic particle, radiographic, eddy current, ultrasonic, spectrometric oil analysis, etc.	U
During Unscheduled Calibration	V
In-Shop Repair and/or Disassembly for Maintenance	W
Upon Receipt or Withdrawal from Supply Stocks	Y
During Initial Equipment Installation	Z

Table 2.3 ACTION TAKEN CODES

ACTION TAKEN DESCRIPTION	CODE
BENCH CHECKED-NRTS - WARRANTY ITEM. Repair not authorized, item under warranty. Items that are adjusted or repaired at non-AF laboratories (manufacturers, etc.) should have the appropriate action taken code entered when processed back into the PMEL.	0
BENCH CHECKED-NRTS - REPAIR NOT AUTHORIZED. Shop is not authorized to accomplish the repair. This code shall only be used when the repair required to return an item to serviceable status is specifically prohibited by current technical directives. This code shall not be used due to lack of authority for equipment, tools, facilities, skill, parts or technical data.	1
BENCH CHECKED-NRTS - LACK OF EQUIPMENT, TOOLS OR FACILITIES. Repair is authorized but cannot be accomplished due to lack of authorized equipment, tools or facilities.	2
BENCH CHECKED-NRTS - LACK OF TECHNICAL SKILLS. Repair cannot be accomplished due to lack of technically qualified people.	3
BENCH CHECKED-NRTS - LACK OF PARTS. Parts are not available to accomplish repair.	4
BENCH CHECKED-NRTS - SHOP BACKLOG. Repair cannot be accomplished due to excessive shop backlog.	5
BENCH CHECKED-NRTS - LACK OF TECHNICAL DATA. Repair cannot be accomplished due to lack of maintenance manuals, drawings, etc., which describe detailed repair procedures and requirements.	6
BENCH CHECKED-NRTS - LACK OF EQUIPMENT, TOOLS, FACILITIES, SKILLS, PARTS OR TECHNICAL DATA. Repair authorized but cannot be accomplished due to lack of authorization to obtain or process required equipment, tools, facilities, skills, parts or technical data.	7
BENCH CHECKED-RETURNED TO DEPOT. Return to depot by direction of System Manager (SM) or Item Manager (IM). Use only when items that are authorized for base level repair are directed to be sent to depot facilities by specific written or verbal communication from the IM or SM or when items are to be sent to depot facilities for modification in accordance with a Time Compliance Technical Order (TCTO) or as Unsatisfactory Material Report (UMR) exhibits.	8

Table 2.3 ACTION TAKEN CODES (Cont.)

ACTION TAKEN DESCRIPTION	CODE
BENCH CHECKED-NRTS - CONDEMNED. Item cannot be repaired and is to be processed for condemnation, reclamation or salvage. This code will also be used when a "condemned" condition is discovered during field maintenance disassembly or repair.	9
REPAIRED – NCR or USER ITEM. Bench check and repaired. Use to record test and repair of NCR items or items repaired at PMEL but calibrated by USER.	A
BENCH CHECKED-SERVICEABLE (NO REPAIR REQUIRED). Use to record following cases where no repair is required. 1. Bench check/verification of NCR items. 2. Turn-in of serviceable items to supply.	B
BENCH CHECKED - DEFERRED. Use when Bench Check is deferred to indicate item is being held awaiting parts, a standard, or necessary technical data.	C
BENCH CHECKED – OFF BASE SUPPORT. . Item is sent Off-Base and is to be returned. This code is also used for items sent to contractors on Base Level contracts. This code will not be used for items returned to a Depot or TRC for overhaul, use applicable “Not Repairable This Station (NRTS) code.	D
BENCH CHECKED – SERVICABLE (CANNOT DUPLICATE). Bench checked, cannot duplicate failure/write-up, no repair is required. Item returned to customer.	E
REPAIRED.	F
CALIBRATED NO ADJUSTMENT. Item is calibrated and no adjustment was made.	J
CALIBRATED- ADJUSTED.	K
RETURNED TO CUSTOMER PER REQUEST. Returned to customer un-calibrated.	M
BENCH CHECKED – STANDARD. Item is an Exchange Standard being returned to the AFPSL. Also, use for Transfer Standards sent to next location or returned to AFPSL.	S
TEST/INSPECT – NON AF CALIBRATION.	V
TEST/INSPECT – AF. Item is tested and/or inspected (other than bench checked) upon being returned from AF Calibration laboratory (e.g., Depot, AFPSL, AF PMEL, etc.). May also be used for other in-house laboratory inspections.	W
TEST/INSPECT-QP. Reserved for PMEL Quality Assurance (PQAs) to document QP inspections (i.e. PR, QR,).	X
Government Quality Assurance Surveillance or AFMETCAL Audit: Item is surveilled by government quality assurance evaluators or audited by AFMETCAL Program certification evaluators. This code is intended to be used to document time by the technician performing the calibration of the item for the evaluator.	Y

Table 2.4 a CALIBRATION CONDITION RECEIVED CODES

CALIBRATION CONDITION RECEIVED DESCRIPTION	CODE
IN-TOLERANCE: The measured values of all parameters tested or calibrated were found to be within specification limits.	A
OUT-OF-TOLERANCE: One or more of the measured values of the parameters tested or calibrated were found to lie outside specifications limits.	B
DEGRADED: Item received with a previous limitation. NOTE: Not to be used for items limited by procedure direction, unless previously calibrated with less than stated procedure limits.	E
UNKNOWN OR NOT APPLICABLE: The item was not calibrated by the PMEL and/or the calibration condition as received can NOT be determined.	F

Table 2.4 b CALIBRATION CONDITION RETURNED CODES

CALIBRATION CONDITION RETURNED DESCRIPTION	CODE
IN-TOLERANCE: Item was calibrated and returned in-tolerance. This includes TO directed limitations.	G
CUSTOMER APPROVED LIMITED CALIBRATION: Item was calibrated, may or may not have been adjusted, and did not meet all OEM specifications and/or TO requirements, but met customer calibration requirements.	K
NOT CALIBRATED: Item returned to the customer not calibrated.	L

Table 2.5 HOW MALFUNCTION (HOW MAL) CODES

Reserved, HOW-MAL codes are no longer required for PMEL MDC reporting. If HOW-MAL codes are needed for other reasons refer to Core Automated Management System (CAMS) HOW-MAL tables.

Table 2. 6 WAR READINESS MATERIAL (WRM) FIELD CODES (Field Cannot Be Blank)

FIELD DEFINITION	LOGIC TABLE	CODE
Deployed. TMDE, which will deploy with the unit to support Air Expeditionary Force (AEF)/contingency operations.	All TMDE that will be deployed to support AEF operations will be coded “ D ”.	D
Not WRM TMDE.	Use if applicable.	N
WRM status temporarily unknown.	This code only authorized on an interim basis. TMDE shall eventually be identified as WRM (W) or Not WRM (N) or Deployed (D).	U
War Reserve Material (WRM). TMDE which is packed/stored to support wartime activities and which is placed on an 18 month WRM calibration interval.	Use if applicable (see TO 00-20-14).	W

SECTION 3

TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE) CALIBRATION

3.1 GENERAL CALIBRATION TECHNICAL ORDERS.

Calibration of TMDE involves an extensive variety of technical data. The following information will be used for the identification and use of TMDE technical data.

NOTE

Some 33K Calibration TOs reference the manufacturer's specifications with statements such as "See Commercial Data" as the Table 1 Accuracy. End item Table 1 specifications for many of these items can be viewed in AFCAV as detailed in Section 7. Technicians are encouraged to submit vendor information to the 562 CBSG technical staff for the end items covered by those 33K calibration TOs which are listed as N/A in the Specifications field of AFCAV ("Specifications Not Posted"). Vendor information in the form of scanned pages commercial operations manual, facsimile from vendor, and/or websites linking to the operating specifications are acceptable. Please send hard copies of vendor information to: 562 CBSG/GBEB, Attn: Spec Data, 813 Irving-Wick Dr. W. Bldg 2, Heath, OH 43056-1199. Scanned images or links to vendor specification web pages can be sent via email to: SpecData@afmetcal.af.mil. For items listed as N/A ("Specifications Not Posted") continue to use local commercial data until the AFCAV data is updated.

a. Publication of TOs.

There are instances where two calibration TOs are listed for the same item. This occurs when new measurement technique TOs consolidate like items or when revisions to current publications using new standards or procedures are published. When new calibration TOs are distributed and new standards are available, the previous TOs will be rescinded.

b. General Calibration TOs.

General Calibration TOs are published to support similar items in one TO. Numerous items may be supported in this manner by grouping the value to be measured and the accuracy and range. TMDE that does not possess sufficient identifiable characteristics; i.e., manufacturer, type number, model number and/or stock number, will be calibrated according to these General Calibration TOs. A request for determination of calibration responsibility is not required for these items. If the accuracy cannot be determined the User will specify the accuracy requirements. These will be treated as special calibrations. This TMDE will be assigned the calibration interval succeeding the general type TOs identified in the following:

Table 3.1 GENERAL CALIBRATION TOs

ITEM TYPE	CALIBRATION TO	CAL INTERVAL
Ammeters, AC	TO 33K1-4-127-1	12 months
Ammeters, DC	TO 33K1-4-131-1	12 months
Ammeters, Panel and General Laboratory types	TO 33K1-4-1611-1	12 months
Attenuator, Coaxial Fixed, ± 0.03 to ± 0.5 dB per 10 dB	TO 33K4-4-25-1	24 months
Attenuator, Coaxial Fixed, $> \pm 0.5$ dB per 10 dB	TO 33K4-4-25-1	ICO
Attenuator, Variable, Step and Toggle Switch	TO 33K4-4-74-1	12 months

Table 3.1 GENERAL CALIBRATION TOs (Cont.)

ITEM TYPE	CALIBRATION TO	CAL INTERVAL
Attenuator, Waveguide Fixed	TO 33K4-4-80-1	12 months
Attenuator, Waveguide Variable	TO 33K4-4-30-1	24 months
Current Shunts	TO 33K1-4-947-1	24 months
Dial Gages	TO 33K6-4-992-1	12 months
Dial Indicators	TO 33K6-4-889-1	12 months
Directional Coupler, coaxial	TO 33K4-4-2-1	36 months
Directional Coupler, hybrid	TO 33K4-4-44-1	24 months
Directional Coupler, waveguide	TO 33K4-4-53-1	24 months
Dynamometers, 0.5 to 2000 g	TO 33K6-4-163-1	12 months
Dynamometers, 0 to 100,000 lbs	TO 33K6-4-874-1	12 months
Fiber Optics Attenuator	TO 33K4-4-391-1	12 months
Fiber Optics Power Meter	TO 33K4-4-385-1	12 months
Fiber Optics Power Meter Prgm	TO 33K4-4-381-1	12 months
Fiber Optics Source	TO 33K4-4-394-1	12 months
Flowmeter, Gas Turbine	TO 33K6-4-1708-1	12 months
Flowmeters, Gas	TO 33K6-4-26-1 and TO 33K6-4-872-1	12 months
Flowmeters, Liquid	TO 33K6-4-817-1	12 months
Flowmeter, Liquid Turbine	TO 33K6-4-900-1	6 months
Frequency Counters	TO 33K3-4-53-1	6 months
Frequency Meter, reed types	TO 33K3-4-1077-1	12 months
Gage, Absolute Pressure	TO 33K6-4-1121-1	12 months
Gage, Compound Pressure	TO 33K6-4-428-1	12 months
Gage Dial Vernier and Digital Calipers	TO 33K6-4-552-1	12 months
Gage, Differential Pressure	TO 33K6-4-557-1	12 months
Gage, Digital Height	TO 33K6-4-1626-1	12 months
Gage, Height Transfer Standard	TO 33K6-4-673-1	12 months
Gage, Height and Vernier Calipers	TO 33K6-4-17-1	12 months
Gage, Plug, Plain	TO 33K6-4-121-1	12 months
Gage, Plug, Plain, Class XXX	TO 33K6-5-255-1	24 months
Gage, Pressure	TO 33K6-4-427-1	12 months
Gage, Ring, Plain, Class XXX	TO 33K6-5-255-1	24 months
Gage, Ring, Plain	TO 33K6-4-2-1	12 months

Table 3.1 GENERAL CALIBRATION TOs (Cont.)

ITEM TYPE	CALIBRATION TO	CAL INTERVAL
Gage, Snap	TO 33K6-4-1678-1	12 months
Gage, Thread Plug, Plain and Truncated	TO 33K6-4-203-1	24 months
Gage, Threaded Ring, Solid	TO 33K6-4-2867-1	6 months
Gage, Tripod Jack/Ram Area	TO 33K6-4-499-1	12 months
Gage, Vacuum	TO 33K6-4-430-1	12 months
Ice Bath	TO 33K-1-104	
Levels	TO 33K6-4-54-1	12 months
Micrometer, Inside	TO 33K6-4-661-1	12 months
Micrometers, Calipers, Digital Caliper and Depth	TO 33K6-4-15-1	12 months
Optical Flat	TO 33K6-4-168-1	12 months
Parallels, Granite	TO 33K6-4-38-1	12 months
Parallels, Steel	TO 33K6-4-731-1	18 months
Power Dividers, (75 Ohm Equivalent Source Impedance)	N64	12 months
Power Dividers, Coaxial, Resistive Type (Non 50 Ohm Equivalent Source Impedance; Non 1:1 Equivalent Source SWR; e.g. 3-resistor configuration)	TO 33K4-4-597-1	12 months
Power Meter, Thermistor Mount/Power Sensor, Using TFCU	TO 33K4-4-190-1	12 months
Power Splitters (75 Ohm Equivalent Source Impedance)	N64.	12 months
Power Splitters, Coaxial, Resistive Type (50 Ohm Equivalent Source Impedance; 1:1 Equivalent Source SWR; e.g. 2-resistor configuration)	TO 33K4-4-510-1	12 months
Power Supplies, DC	TO 33K1-4-25-1 and TO 33K1-4-1000-1	12 months
Pyrometer	TO 33K5-4-75-1 or TO 33K5-4-293-1	12 months
Relief Valves	TO 33K6-4-278-1	12 months, see Note N38
Right Angle Iron	TO 33K6-4-157-1	12 months
Scales, Spring and Force	TO 33K6-4-16-1, TO 33K6-4-18-1, TO 33K6-4-88-1 and TO 33K6-4-798-1	15 months
Scales and Balances, Dial and Beams, 0 to 500 lbs	TO 33K6-4-41-1	12 months
Scales and Balances, Digital Readout, 0 to 500 lbs	TO 33K6-4-3356-1	12 months
Scales, Weighing, 500 to 10000 lbs	TO 33K6-4-72-1	12 months
Sine Plates and Sine Bars	TO 33K6-4-120-1	12 months
Sound Level Calibrators	TO 33K3-4-2961-1	12 months
Straight Edges	TO 33K6-4-144-1	12 months
Surface Plates	N47	24 months
Terminations, Mismatches and Offsets, BNC Connector	TO 33K4-4-589-1	24 months
Terminations, Mismatches and Offsets, GR Connector	TO 33K4-4-589-1	24 months
Terminations, Mismatches and Offsets, Type K Connector	TO 33K4-4-589-1	24 months
Terminations, Mismatches and Offsets, Type N Connector	TO 33K4-4-589-1	24 months
Terminations, Mismatches and Offsets, 3.5 mm Connector	TO 33K4-4-589-1	24 months
Terminations, Mismatches and Offsets, 7 mm Connector	TO 33K4-4-589-1	24 months
Thermistors	TO 33K5-4-1-1-16	12 months
Thermistor Mounts, RF	TO 33K4-4-52-1	12 months
Thermometers	TO 33K5-4-42-1 and TO 33K8-4-445-1	24 months

Table 3.1 GENERAL CALIBRATION TOs (Cont.)

ITEM TYPE	CALIBRATION TO	CAL INTERVAL
Thermometers, Dial	TO 33K5-4-28-1	12 months
Thread Gaging Elements, Internal and External	TO 33K6-4-2883-1	12 months
Torque Indicating Devices	TO 33K6-4-2193-1	3 months
V-Blocks	TO 33K6-4-553-1	12 months
Voltmeters, AC	TO 33K1-4-1548-1	12 months
Voltmeters, DC	TO 33K1-4-1586-1	6 months
Voltmeters, panel and general laboratory types	TO 33K1-4-1611-1	12 months
Wattmeters, RF	TO 33K4-4-69-1	6 months
Wavemeters	TO 33K4-4-196-1	6 months
Weights, class 3, 4, 5 (old S1, P, Q)	TO 33K6-4-763-1	12 months
Weights, class M2, C, T, F, 6	TO 33K6-4-815-1	12 months
Weights, dental office weights	TO 33K6-4-164-1	12 months
Weights, troy and apothecary weights	TO 33K6-4-228-1	12 months
Wires, Gear	AFPSL	36 months
Wires, Thread measuring	AFPSL	36 months

Table 3.2 GENERAL WUC**NOTE**

TMDE that does not possess sufficient identifiable characteristics; i.e., manufacturer, type number, model number and/or stock number will have a general WUC assigned. Listed below is some equipment that meets these requirements and are listed by Noun and/or Description and FSC with their applicable WUC. General WUCs will not be used for specific items identified in TO 33K-1-100-2 and CMSs with individual WUC assigned.

WUC	DESCRIPTION
ZZ999	TMDE Not Otherwise Coded (NOC). To be used for Federal Stock List items (for which coding requests have been submitted) until they are assigned an individual code.
ZZ300	IAW TO 00-25-06-2-2, this code will be used for support equipment not otherwise coded (including local manufactured, local purchase, low inventory, etc.)
ZCX70	Ammeters, Panel Mounted (All FSCs)
YQC80	Arbitrary Scale Meter, Panel Mounted (All FSCs)
YC870	Attenuators, Fixed Coaxial (All FSCs)
XCRNA	Attenuators, Variable (All FSCs)
YCS50	Audio Level Meter, Panel Mounted (All FSCs)
ZARLH	Calipers, Digital Outside Micrometers
YEF00	Calipers, Inside Micrometers (All FSC 5210)
YEE90	Calipers, Outside Micrometers (All FSC 5210)
WAMAM	Current Shunts (All FSCs)
XCMAC	Dial Bore Gages (All FSC 5210)
YEF30	Dial Indicators (All FSC 5210)
ZAWKH	Differential Pressure Gages (All FSCs)
WGMWE	Directional Couplers, Coaxial (All FSCs)
ZCQBN	Directional Couplers, Hybrid (All FSCs)
WGMWF	Directional Couplers, Waveguide (All FSCs)
XCVYH	Dynamometers (All FSCs)

Table 3.2 GENERAL WUC (Cont.)

WUC	DESCRIPTION
ZBZNJ	Fiber Optic Power Source
ZBZNK	Fiber Optic Power Meter Programmable
ZBZNH	Fiber Optic Power Meter and Attenuator
ZCT50	Filters (All FSCs)
XBWHV	Flowmeters, Gas (All FSCs)
XBWHW	Flowmeters, Liquid (All FSCs)
XCERJ	Frequency Meters, Reed Type (All FSCs)
WGUHN	Gage, Compound (All FSCs)
YEF20	Gage, Caliper Depth Micrometer (All FSC 5210)
XCUQF	Gage, Dial, Vernier and Digital Calipers (All FSC 5210)
YJ620	Gage Height and Vernier Calipers (All FSC 5210)
WBDAA	Gage, Height Transfer Standard (All FSC 5210)
XCHYV	Gage, Oxygen (All FSCs)
YHK20	Gage, Plug, Plain (All FSC 5210 and 5220)
WCPKA	Gage, Plug, Plain, Class XXX
XBLMS	Gage, Pressure (All FSCs)
ZCYZE	Gage, Ring, Plain (All FSCs)
WEPKA	Gage, Ring, Plain, Class XXX
ZASVN	Gage, Snap (All FSCs)
YLN90	Gage, Stretch (All FSCs)
ZAUDR	Gage, Thread Plug, Plain and Truncated
WAAZA	Gage, Threaded Ring, Adjustable
ZAUDQ	Gage, Threaded Ring, Solid
ZBVXD	Gage, Tripod Jack/Ram Area
XCEUM	Gage, Vacuum (All FSCs)
YNL30	Levels (All FSC 5210)
YKG20	Networks (All FSCs)
ZBPHJ	Optical Flat (All FSCs)
ZAQXR	Parallels, Granite (All FSC 5220)
XCHXC	Parallels, Steel (All FSC 5220)
ZCQBP	Power Divider (All FSCs)
WAMAN	Power Splitters (All FSCs)
XBPFW	Power Supplies (All FSCs)
ZBTFP	Pyrometers
ZCGCB	Relief Valves
ZBQDK	Right Angle Iron (All FSCs)
WGMRV	Scales, Weighing (All FSCs)
YNV50	Sine Plates and Sine Bars (All FSC 5220)
XBUTL	Spring and Force Scales (All FSCs)
YMZ80	Straight Edge (All FSC 5210 and 6675)
YL380	Surface Plates (All FSC 5220)
WGUHP	Thermistors (All FSCs)
WGMTA	Thermometers, Dial (All FSCs)
XBLMR	Thermometers (liquid-in-glass)
ZBKWE	Thread Gaging Elements, Internal and External (All FSCs)
YEN30	Torque Wrenches and Handles (All FSCs)
ZBWNM	V-Blocks

Table 3.2 GENERAL WUC (Cont.)

WUC	DESCRIPTION
YYP30	Voltmeters, Panel Mounted (All FSCs)
YC790	Wattmeters, Panel Mounted (All FSCs)
ZCQBQ	Weights, Class 3, 4, 5 (old S1, P, Q) (All FSCs)
ZCQBR	Weights, Class M2, C, T, F, 6 (All FSCs)
ZCQBS	Weights, Dental Office Weights (All FSCs)
ZCQBT	Weights, Troy and Apothecary Weights (All FSCs)
ZBQDH	Wires, Gear (All FSCs)
ZBQDJ	Wires, Thread Measuring (All FSCs)

3.2 SPECIFIC TMDE AND EQUIPMENT.

Aerospace Audio-Visual Services (AAVS) Video TMDE.

AAVS Video TMDE that is used to give visual indications of the video signal and is not used to broadcast or measure broadcast signals is not normally calibrated in the PMEL. The calibration support for this equipment will be mutually agreed to by the PMEL Chief and the User. A calibration responsibility request will be submitted IAW TO 00-20-14 to resolve any disagreement.

Automatic Data Processing Equipment (ADPE).

ADPE is not considered TMDE and will not be listed in TO 33K-1-100-2.

Automotive Test Equipment.

Test equipment used solely for automotive support (tire gages, tach-dwell meters, compression testers, etc.) do not require calibration. Calibration responsibility request should not be submitted on these items. Exceptions to this are Torque Wrenches and the more sophisticated engine analyzing equipment. The calibration support for this equipment will be mutually agreed to by the PMEL Chief and the User. A calibration responsibility request will be submitted IAW TO 00-20-14 to resolve any disagreement.

Computer/PC Clocks.

Computer/PC Clocks do not require calibration when used for program timing events; i.e., data printouts, delays, settling time, etc.

Electrical Meters.

The Electrical Meters referred to in the General Calibration TOs are those used for measuring voltage, current or other properties as an entity and not those incorporated in combination test sets such as Multimeters. General Calibration TOs are being prepared in such a way that calibration may be accomplished with the standards presently available. Calibration TOs for panel meters will not be prepared because the applicable TO for the TMDE, subsystems, or facilities will include calibration of these items. Requests for determination of calibration responsibility should include the application and nomenclature of the end item on which the meter is a component part.

Gage, Plug, Plain.

Individual Plain Plug Gages will not be identified in TO 33K-1-100-2. Individual Plain Plug Gages other than Class XXX will be calibrated by PMEL using TO 33K6-4-121-1, calibration interval 12 months, WUC YHK20.

Gage, Plug, Plain, Class XXX.

Individual Plain Plug Gages, Class XXX, will not be identified in TO 33K-1-100-2. Individual Plain Plug Gages, Class XXX, will be calibrated by the AFPSL using TO 33K6-5-255-1, calibration interval 24 months, WUC WCPKA.

Gage, Ring, Plain, Class XXX.

Individual Plain Ring Gages, Class XXX, will not be identified in TO 33K-1-100-2. Individual Plain Ring Gages, Class XXX, will be calibrated by the AFPSL using TO 33K6-5-255-1, calibration interval 24 months, WUC WEPKA.

Gage, Thread Plug, Plain and Truncated.

Individual Thread Plug Gages, Plain and Truncated will not be identified in TO 33K-1-100-2. Individual Thread Plug Gages, Plain or Truncated will be calibrated by PMEL using TO 33K6-4-203-1, calibration interval 24 months, WUC ZAUDR.

Gage, Ring, Plain.

Individual Plain Ring Gages will not be identified in TO 33K-1-100-2. Individual Plain Ring Gages other than Class XXX will be calibrated by PMEL using TO 33K6-4-2-1, calibration interval 12 months, WUC ZCYZE.

Gage, Threaded Ring, Adjustable.

Refer to TO 33K-1-100-2, WUC WAAZA.

Gage, Threaded Ring, Solid.

Individual Solid Threaded Ring Gages will not be identified in TO 33K-1-100-2. Individual Solid Threaded Ring Gages will be calibrated by PMEL using TO 33K6-4-2867-1, calibration interval 6 months, WUC ZAUDQ.

Gage Block Accuracies.

(1) Gage Block Accuracies:

Type IIA and IIC PMELs will support gage block sets to an accuracy of ± 12 or $20 \mu\text{in}$. If a PMEL customer requires better than $\pm 12 \mu\text{in}$ uncertainty, forward a request for calibration support to 562 CBSG/GBHA. The request must include documentation and justification for uncertainties better than $\pm 12 \mu\text{in}$. Customers with valid requirements for uncertainties better than $\pm 12 \mu\text{in}$ will be supported by the AFPSL after approval by 562 CBSG. The AFPSL will support the 36 Exchange Set for all PMELs.

Calculation of uncertainty for Gage Blocks (to determine if an item can be calibrated in an environment other than 68°F): If the Coefficient of Thermal Expansion (CTE) can be corrected for then this number is 0, the uncertainty of the CTE remains at 10% of the CTE and must be calculated for. Both cases are shown below.

Case 1: CTE is NOT corrected for:

Room Temperature: 74°F

Coefficient of Thermal Expansion (CTE) for steel: $6.4 \mu\text{in/in}/^\circ\text{F}$

Uncertainty of CTE for steel: $0.64 \mu\text{in/in}/^\circ\text{F}$

Size of Gage Block Stack: 4.52 inches

Number of Gage Blocks: (4.00, 0.400, 0.120)

Uncertainty of Gage Blocks: $\pm 12 \mu\text{in}$ (from Calibration Certificate)

Uncertainty = $((\text{Room Temperature} - 68) \times (\text{CTE}) \times (\text{Gage Block Size}))^2 + ((\text{Room Temperature} - 68) \times (\text{Uncertainty of CTE}) \times (\text{Gage Block Size}))^2 + ((\text{RSS Gage Block Uncertainty})^2)^{1/2}$

$$\begin{aligned}
 \text{Uncertainty} &= (((74 - 68) \times 6.4 \times 4.52)^2 + ((74 - 68) \times 0.64 \times 4.52)^2 + (12^2 + 12^2 + 12^2)^{1/2})^2)^{1/2} \\
 &= ((6 \times 6.4 \times 4.52)^2 + (6 \times 0.64 \times 4.52)^2 + (144 + 144 + 144)^{1/2})^2)^{1/2} \\
 &= ((173.57)^2 + (17.36)^2 + (20.78)^2)^{1/2} \\
 &= (30126.54 + 301.37 + 431.81)^{1/2} \\
 &= (30859.72)^{1/2} \\
 &= 175 \mu\text{in}
 \end{aligned}$$

Case 2: CTE is corrected for:

Room Temperature: 74 °F

Coefficient of Thermal Expansion (CTE) for steel: 6.4 µin/in/°F

Uncertainty of CTE for steel: 0.64 µin/in/°F

Size of Gage Block Stack: 4.52 inches

Number of Gage Blocks: (4.00, 0.400, 0.120)

Uncertainty of Gage Blocks: ±12 µin (from Calibration Certificate)

Uncertainty = (((Room Temperature - 68) x (CTE) x (Gage Block Size))² + ((Room Temperature - 68) x (Uncertainty of CTE) x (Gage Block Size))² + ((RSS Gage Block Uncertainty)²)^{1/2}

$$\begin{aligned}
 \text{Uncertainty} &= (((74 - 68) \times 0 \times 4.52)^2 + ((74 - 68) \times 0.64 \times 4.52)^2 + (12^2 + 12^2 + 12^2)^{1/2})^2)^{1/2} \\
 &= ((6 \times 0 \times 4.52)^2 + (6 \times 0.64 \times 4.52)^2 + (144 + 144 + 144)^{1/2})^2)^{1/2} \\
 &= ((0)^2 + (17.36)^2 + (20.78)^2)^{1/2} \\
 &= (0 + 301.37 + 431.81)^{1/2} \\
 &= (733.18)^{1/2} \\
 &= 27 \mu\text{in}
 \end{aligned}$$

(2) Packing Information:

All calibrated Gage Block sets will be pre-packaged by the calibrating laboratory before they leave the laboratory to avoid damage of the Gage Blocks. The packaging includes oiling the Gage Blocks and placing packing inside the case to hold blocks in position. The case will then be taped shut both lengthwise and widthwise.

Gage Block Sets.

The number of Gage Blocks in a set will be the P/N for that Gage Block Set. The Noun field will state the type of the set. PMEL Gage Block Sets consist of three types: Cal and Return Sets (Cal/Ret), Exchange Sets (Exchange), and Working Sets (Working). AFPSL will calibrate Cal and Return Sets for Type IIA and IIC PMELs. AFPSL will calibrate Exchange Sets for the PMELs. The Type IIA and IIC PMELs will calibrate Working Sets.

Example:

P/N	WUC	Nouns	Cal TO	Int	MFG	CAGE	Cal Resp
36	WGVDJ	Gage Block Set, Working	33K6-4-1-1	12	FEDSP	81348	PMEL (68°)
36	XAUYZ	Gage Block Set, Exchange		24	FEDSP	81348	AFPSL
36	ZAWBR	Gage Block Set, Cal/Ret		24	FEDSP	81348	AFPSL

NOTE

Ceramic Gage Block Sets will not be supported by the AFPSL. These sets will not be used as reference standards.

Gage Blocks and Gage Block Accessories Individual.

Gage Blocks and Gage Block Accessories are generally listed in the TO 33K-1-100-2 as sets. Individual Gage Blocks and Gage Block Accessories will not normally be listed in TO 33K-1-100-2. Individual Gage Blocks and Gage Block Accessories shall be calibrated IAW TO 33K6-4-1-1, Cal Int 12 months. The WUC for individual Gage Blocks and Gage Block Accessories will be ZCVXP.

Microwave.

(1) General Lab TMDE. Adapters, tees (coaxial and waveguide), isolators, cables, circulators, filters, shorts, opens, switches, RF Limiters and waveguides (flex, bends, twist, etc.) that cannot be repaired or adjusted are not listed in TO 33K-1-100-2 (Equipment Calibration Requirements List). These items are considered NCR and will not be calibrated unless a quantitative type measurement is being performed. If this type measurement is required, the item will be calibrated before use.

(2) RF Power Meters and Thermistor Mounts or Power Sensors. If the User submits these items simultaneously for calibration, the PMEL may choose to assign all the items a calibration interval equal to the shortest interval listed for any one of the components individually.

(3) Microwave Vector Network Analyzer Calibration and Verification Kits. If a Calibration Kit or Verification Kit for a Vector Network Analyzer contains a Torque Wrench, the Torque Wrench is not defined as part of the Vector Network Analyzer Calibration Kit or Verification Kit. Although the Torque Wrench can be stored/travel with the kit for the convenience of the Owner/User, it is not assigned the same WUC as the kit. The Torque Wrench part number should be assigned the appropriate WUC as referenced in TO 33K-1-100-2, as a stand-alone item. If the Torque Wrench is not listed in TO 33K-1-100-2 as a stand-alone item, then an AFTO 45 is required to be submitted.

Plant and Facilities Equipment.

A physical plant or other facility such as a power station, heat plant, or desalinization plant shall have a TMDE coordinator, as specified in TO 00-20-14, and shall work with the local PMEL to submit calibration determinations for applicable TMDE. TMDE are those devices used to maintain, evaluate, measure, calibrate, test, inspect, diagnose, or otherwise examine materials, supplies, equipment, and systems to identify or isolate actual or potential malfunction, or decide if they meet operational specifications established in technical documents.

Equipment that is used solely for the daily operation of a facility does not require calibration by the PMEL if the TMDE User has designated an item No Periodic Calibration (NPC). NPC is applicable if the TMDE performance is verified, checked, or monitored by other PMEL certified TMDE, or does not affect safety and is not used to verify equipment performance factors or make absolute measurements. The NPC equipment will be tested, serviced, maintained, and verified as required by the plant operation guides, TOs, or procedures.

However, any test equipment used for the verification, maintenance, or alignment will fall under the requirements of AFI 21-113 and TO 00-20-14 and be calibrated IAW TO 33K-1-100-2. The PMEL Chief and the User will mutually agree to the calibration support for this equipment and submit a Request for Calibration Determination (AFTO Form 45) for that test equipment not already identified in TO 33K-1-100-2.

Power Supplies.

Not all TMDE related Power Supplies are used in applications requiring calibration. It is the responsibility of the User and the PMEL to review each application and determine which Power Supplies require periodic calibration. Special attention should be given to those identified in the Calibration Measurement Summaries (CMS) and TO 33K-1-100-2. Power Supplies that do not require periodic calibration may be made NPC IAW TO 00-20-14. Work Unit Code XBPFW will be used to report maintenance actions for Power Supplies not listed in TO 33K-1-100-2 or the CMS.

Pressure Gages, General Purpose.

Large quantities of General Purpose Pressure Gages are used throughout the Air Force, which are not listed in TO 33K-1-100-2 (Equipment Calibration Requirements List). The following applies:

- (1) If the gage has a manufacturers name, part number, and verifiable specifications, an AFTO Form 45 shall be submitted.
- (2) If the gage has no identifiable manufacturer, part number or specifications, a special calibration may be performed (TO 00-20-14) using General Calibration TOs 33K6-4-427-1, 428-1 and 430-1.

Pressure Measuring Equipment.

A Skydrol fluid pressure standard shall be used to calibrate Skydrol Fluid Pressure Gages. The gage User is responsible for calibrating these gages.

Pressure Regulators.

Pressure Regulators and associated pressure measuring or indicating devices used with gas supply bottles or with non-critical piped gas or fluid apparatus, such as air or water lines, are not considered to be TMDE and do not require calibration. Pressure gages used on liquid oxygen servicing carts will be calibrated/verified as listed in TO 33K-1-100-2 (Equipment Calibration Requirements List) or IAW the applicable maintenance manual.

Scales and Balances.

Scales used directly for life support, that is, patient scales used in chemotherapy, infant scales used in nurseries, bed scales used to measure fluid intake and loss, and scales used in the Commander's Support Staff (CSS) Fitness Program (FP) and the flight medicine sections will require PMEL support (see AFI 41-201, para 2.53). Special consideration should be given to the following scales, balances, and weights.

(1) Hospital and Medical Scales. Only those scales used directly for life support and those scales used in flight medicine sections will require PMEL support. Intervals on scales used for life support will not exceed six months, even if a longer interval is listed. If the Users have the necessary weights to calibrate hospital or medical scales (non life-support), the PMEL will calibrate the weights and the User will calibrate the scales. If the Users do not have the necessary weights to calibrate the scales, the PMEL will calibrate the scales. Scales used in life support that cannot be identified to a part or model number can be calibrated using TO 33K6-4-285-1. All cases not covered by this para shall be identified in accordance with AFI-41-209, by the User. Requests for commercial calibration of scales should be denied.

(2) Commander's Support Staff (CSS) Fitness Program (FP) Scales. The PMEL will calibrate all FP scales. It is the responsibility of local officials/commanders to determine which scales within an organization will be used for the FP. Scales used for the FP will be calibrated at least every 12 months, even if a longer interval is listed. Users will identify to the local PMEL scales used in the FP. Scales used in the FP that cannot be identified to a part or model number can be calibrated using TO 33K6-4-285-1. Requests for commercial calibration of FP scales should be denied.

(3) Dental Weights. Weights supplied with dental scales will be calibrated as E617 class 5 Dental Weights.

(4) Postal Scales. Intervals on scales used in Post Offices or mail rooms will not exceed 12 months, even if a longer interval is listed.

(5) Commissary/all Food Service Scales. Scales will be certified every 12 months or as required by state law. It is the responsibility of the User to provide funding and to provide calibration support from one of the following:

- (a) Contract Calibration
- (b) Local PMEL (By Support Agreement only)

(6) Truck Scales. Scales used for the weighing of trucks used in interstate commerce shall be certified by the state. Scales will be certified as required by state law. It is the responsibility of the User to provide funding and to negotiate calibration support. Truck scales used solely for interstate commerce will not be listed in the TO 33K-1-100-2. Truck scales used to support aircraft will be listed in a CMS or TO 33K-1-100-2.

(7) Passenger Terminal Scales:

- (a) Federal Aviation Administration (FAA) regulations or host nation law takes precedence over TO 00-20-14 requirements for calibration of Passenger Terminal Scales. If these regulations or law requires calibration of a Passenger Terminal Scale, PMEL shall provide the support unless prohibited by these regulations/laws. If calibration support is not available from a PMEL, or is beyond PMEL capability, then the User shall submit a commercial calibration request IAW TO 00-20-14. It is the responsibility of the User to identify the calibration requirements to the PMEL. Use a support agreement when applicable. Submit an AFTO Form 45 IAW TO 00-20-14 for scales that require calibration and are not listed in TO 33K-1-100-2.

(b) Where FAA regulations or host nation laws do not apply, and the scale must be used to determine aircraft fuel calculations/load balancing requirements, PMEL shall calibrate and certify the scale. It is the responsibility of the User to identify their calibration requirements to the PMEL. Use a support agreement when applicable. Submit an AFTO Form 45 IAW TO 00-20-14 for scales that require calibration and are not listed in TO 33K-1-100-2.

(c) Passenger Terminal Scales that are not required to be calibrated by FAA regulations or host nation law and are not used to determine aircraft fuel calculations/load balancing requirements are not considered TMDE, and will not be listed in TO 33K-1-100-2. PMEL support is not authorized for these scales. If the User desires a calibration, the User must fund a contract calibration. Do not submit an AFTO Form 45 for these scales.

Stopwatches.

Calibration of stopwatches is not required. However, periodic maintenance including cleaning, lubricating, and adjustment by qualified personnel should be performed. This determination is based on the following: A Stopwatch in actual usage is subject to large human error, as much as 0.2 seconds to more than one (1) second depending on whether the start and stop signals can be anticipated. Attempting to increase the accuracy of the watch by accurate calibration will not ensure overall accuracy in its use. The tolerance specified in Military Specification MIL-S-14823-4 and Federal Specification GG-S-764C is considered to be within the ability of a watch repairman without using calibration standards. The normal cleaning, lubricating, repair, and adjusting procedures that are followed are considered adequate. This will satisfy the requirements for RADIAC.

Surface Plates.

The following are methods to calibrate Surface Plates. Grade A Surface Plates will be calibrated using the method with the highest precedence for which the PMEL has capability:

Method 1	Laser Interferometer	TO 33K6-4-10-1	Grade AA
Method 2	Leveling System	TO 33K6-4-2696-1	Grade AA
Method 3	Autocollimator	TO 33K6-4-137-1	Grade AA
Method 4	Planekator	TO 33K6-4-33-1	Grade A

When calibrating Surface Plates, methods 1, 2 and 3 are of equal precedence. Method 4 is the lowest precedence.

Tape Measures and Rules (Metal).

In general, Metal Tape Measures and Rules do not require calibration. United States manufacturing processes for Metal Tape Measures and Rules comply with NIST Handbook 44, Section 5.52.T1 or T2, which satisfy all requirements for AFMETCAL Program Calibration Procedures.

Thermo Luminescent Dosimeters.

Thermo Luminescent Dosimeters (TLD) used to monitor occupational exposure to ionizing radiation are provided, processed and analyzed by the USAF Personnel Dosimetry Program IAW AFMAN 48-125. For TLDs used solely to monitor occupational exposure to ionizing radiation as defined in AFMAN 48-125, requests for calibration determination should not be submitted to 562 CBSG.

Thermocouples, Thermocouple Probes, and Thermocouple Wires.

Thermocouples, Thermocouple Probes, and Thermocouple Wires that are to be used with calibrated indicators need not be calibrated if they bear the designation K, T, J, R, E or S. These designations show that the thermocouple or wire has been manufactured IAW one or more of the following standards for the wire type indicated, ANSI/MC96.1, BS 1843, DIN 43714, JIS C 1610-1981 or NF C 42-323. Thermocouple wires manufactured to these specifications have been certified by the manufacturer and do not require initial or subsequent calibration.

Liquid in Glass (LIG) Thermometers :

1) LIG thermometers that are to be used for fuel accountability purposes shall be certified using the General Calibration TO at least once a year IAW MIL-HDBK-201B. Range and accuracy shall be supplied by the user and shall be annotated on the Certification Label. Part or type numbers for these LIG thermometers shall be listed in the TMDE Calibration Interval, Technical Order and Work Unit Code Reference Guide (33K-1-100-2) and the "Remarks" section shall indicate the thermometer is only to be calibrated if used for fuel accountability. Refer to TO 00-20-14, for further guidance, if needed, with special calibrations.

2) LIG thermometers with scale divisions larger than 0.2 (degrees Celsius or degrees Fahrenheit) (i.e., 0.5, 1, 2, etc.), if determined by the user and PMEL Manager to require a periodic calibration, based on application or use, will be calibrated using a General Calibration TO with the associated calibration interval. Range and accuracy shall be supplied by the user. Range and accuracy will be annotated on the Certification Label. Part or type numbers for these LIG thermometers will not be listed in the TMDE Calibration Interval, Technical Order and Work Unit Code Reference Guide (33K-1-100-2) but shall be listed in the PMEL's local K-100. Refer to TO 00-20-14 for further guidance, if needed, with special calibrations.

3) LIG thermometers for general use with scale divisions larger than 0.2 (degrees Celsius or degrees Fahrenheit) (i.e., 0.5, 1, 2, etc.) require initial calibration only. Part or type numbers for these LIG thermometers will not be listed in the TMDE Calibration Interval, Technical Order and Work Unit Code Reference Guide (33K-1-100-2) but may be listed in the PMEL's local K-100 at the discretion of the PMEL Manager.

Torque Indicating Devices.

(1) Torque Indicating Devices are TMDE and will be listed in TO 33K-1-100-2. If the Torque Indicating Device has a manufacturers name, part number and verifiable specifications, an AFTO Form 45 shall be submitted.

(2) If the device cannot be identified by manufacturer, part number or accuracy a special calibration may be performed (TO 00-20-14) using the General Calibration TO. These torque devices will be calibrated in one direction only (either CW or CCW) as stated by the User.

(3) Repair information for Hand Torque Devices may be found in TO 32B14-3-1-101.

Vibration Pickups.

Vibration Pickups installed on C-141 aircraft engines do not require calibration.

Wires, Gear.

Gear Wires come in pairs, and the individual pairs will not normally be listed in TO 33K-1-100-2. Gear Wire pairs will be calibrated at AFPSL, Cal Int 36 months. The WUC will be ZBQDH.

Wires, Thread Measuring.

Thread wires come in sets of three, and the sets will not normally be listed in TO 33K-1-100-2. The sets will be calibrated at AFPSL, Cal Int 36 months. The WUC will be ZBQDJ.

3.3 ABBREVIATIONS AND TERMS.

The Equipment Calibration Requirements List contains many abbreviations, terms and notes explaining particular calibration responsibilities, status or intervals. The following explains these items as they are used in this list.

ABSOLUTE.

Designated Measurement Standards based on the absolute value of natural physical constants whose values can be accurately reproduced under carefully controlled conditions. Examples are LASER Length Standards, Josephson Junction Voltage Standard and Hall Effect Magnetic Field Standards.

AFPSL.

Items calibrated by the AFPSL at Heath, Ohio. The AFPSL funds maintenance incidental to calibration of operational items only.

CALIBRATION NOTES.

Specific calibration determination instructions that cannot be accommodated by the other defined Abbreviations and Terms. Individual calibration notes (NXX) are detailed in TO 33K-1-100-2 and may be viewed in AFCAV.

COM DATA.

Commercial data that has been approved for use in performing calibration and/or maintenance.

CONTRACT.

Calibration obtained from a contracted source, funded by the User or an Item/Program Manager. Neither the PMEL nor 562 CBSG centrally manages or funds these calibrations. All CONTRACT TMDE shall be coordinated with the PMEL for reporting purposes.

ICO (Initial Calibration Only).

A designation assigned in the CAL INT column of the Equipment Calibration Requirements List to TMDE that does not require periodic calibration per TO 00-20-14.

IM.

The calibration of items with "IM" in the Cal Resp column will be obtained via Contractor Logistic Support (CLS) arranged by the Item Manager and coordinated with 562 CBSG. Contact the Item Manager if you have funding concerns. These calibrations are not funded through 562 CBSG.

MED.

Medical equipment used in a hospital for direct patient care. This includes anesthesia controllers, incubators, iron lungs, respirators, and other equipment in this category. Medical equipment personnel have the responsibility for this equipment. For further definition refer to AFI 41-201 and AFI 41-209.

NCR.

No Calibration Required.

NEC.

No End-Item Calibration. NEC in the calibration interval denotes TMDE designated See Individual Component Listing (SICL) that do not have an end-item calibration requirement. NEC only applies to the end-item, not subcomponents listed with separate calibration intervals. NOTE: For scheduling systems that have not been updated to process NEC, load as NCR. Bar code and Certification Labels are not required on NEC coded SICL end-items that do not physically exist.

NHA.

Next Higher Assembly. NHA in the calibration interval field of TO 33K-1-100-2 denotes components that are calibrated as part of a next higher assembly. The calibration interval and calibration TO of the next higher assembly apply unless otherwise noted. NHA items shall not generate a separate "due calibration" in addition to the end item. The next higher assembly end-item calibration sticker applies to all components designated NHA. NOTE: For scheduling systems that have not been updated to process NHA, load as NPC so only the next higher assembly is scheduled for calibration.

NIST.

Any item listed NIST in the Cal-Resp column will be calibrated by the National Institute of Standards and Technology (NIST). Coordination for calibration services will be made in advance with 562 CBSG.

NPC.

No periodic calibration.

OO-ALC, WR-ALC, OC-ALC.

Items to be calibrated by the designated Air Logistics Centers PMEL.

PART NUMBER PAREN.

Part number or type with paren will not be listed in TO 33K-1-100-2. The full part number or series part number will be listed only.

PMEL.

The PMEL is responsible for calibration and maintenance. If NCR is listed in Cal Int column of Equipment Calibration Requirements List, TMDE does not require calibration and PMEL is responsible for performing maintenance.

PMEL (68 DEG).

Any item with a Calibration Responsibility of PMEL (68 DEG) will be supported by a PMEL with an authorized 68 degree dimensional calibration area.

PMEL/CONTRACT.

The PMEL is responsible for calibration. Maintenance support will be obtained from a commercial source.

PMEL2A.

Any item with a Calibration Responsibility of PMEL2A will be supported by a Type IIA PMEL.

PMEL/USER.

The PMEL is responsible for calibration to the extent designated in the Calibration Measurement Summary (CMS), system support plan, or other calibration instructions. All other support will be provided by the User. No adjustments that affect calibration will be made by the User.

RADIAC.

Radiation Detection, Identification, and Computation.

SICL (See Individual Component Listing).

Designates an end-item of TMDE, such as consoles, testers, automatic test equipment or a part number, consisting of components, which are separately listed by individual part number, support responsibility, calibration interval, Calibration TO and a WUC related to the end-item WUC. The list of components may include both original and replacement components. Additional SICL item guidelines:

- (1) The PMEL has support responsibility for end-items designated PMEL/SICL. The User has support responsibility for end-items designated USER/SICL or SICL.
- (2) NCR components that are PMEL responsibility will be listed.
- (3) Maintenance responsibility for components not listed is the same as the end-item.
- (4) An end-item that requires periodic calibration will have an interval and calibration TO listed.
- (5) An end-item with no end-item calibration will have NEC listed as the calibration interval. (See NEC definition.)
- (6) Components calibrated as part of the end-item (i.e., a system calibration) will have NHA listed as the calibration interval. (See NHA definition.)
- (7) The SRD of the end-item should be used for each component.
- (8) The SICL component WUC shall be used to ensure MDC data reflects end-item usage.

- (9) The User has the responsibility to identify to the PMEL the end-item part number and bar code number for each component to assure proper annotation of WUC and calibration interval.
- (10) If the end-item is designated NEC, enter "NEC" in the DATE CALIBRATED block. Certification Labels are not required on NEC coded SICL end-items that do not physically exist.
- (11) Bar code labels will only be applied to SICL end-items and SICL components that are PMEL or AFPSL responsibility.

SICW (See Item Calibrated With).

Items that cannot be calibrated by themselves but require another item will have SICW entered in the Cal Resp column and SCW entered in the Cal Int column of the Equipment Calibration Requirement List. No Calibration Interval, Calibration Responsibility nor Calibration TO will be listed for these items. (Note: as an example, a display, meter, or transducer may be listed as the SICW item. All items are scheduled together. The calibration interval and calibration TO used for the SICW components are those listed for the prime part number). Attach a Certification Label to these items using the SPECIAL block to identify either The Bar Code Number or the part number and serial number of the end item it is calibrated with. The SPECIAL block of the end item Certification Label will list either the Bar Code Numbers or the part numbers and serial numbers of all items calibrated with the end item.

If the end item is unknown, contact the User to properly identify the end item and all the items that are calibrated with it. The end item and all the items identified with it shall be calibrated at the same time.

SSA (Same Specifications As).

The abbreviation SSA is used in the nomenclature column of the equipment listing to identify the applicable specification when the TO contains more than one set of accuracy specifications.

SW (Special Weapons).

Items that are identified by SW following the nomenclature are specific items of Nuclear Ordnance Commodity Manager (NOCM) approved as special weapons test equipment used by Air Force activities.

TO IN PROCESS.

A "T" in the Change Code indicates that a new TO is being prepared or an existing TO is being changed for the item in question. The TO will be prepared or changed as priority and workload permit. In the interim, the Maintenance TO or commercial data, as applicable, will be used.

TRC.

Items to be supported at a Technology Repair Center (TRC)--Command certification is not required. Equipment owners should contact the IM for shipping instructions, repair approval, and estimated turn-around time. Support should be obtained IAW procedures specified in TO 00-25-107.

USER.

The using activity or owning organization is responsible for calibration and maintenance. In most cases, the User and owner are the same. In general, the User is the activity that physically uses the item. The owner is the organization that owns the item via a supply account. The User performs user calibrations or coordinates with the PMEL for assistance when resources are not available. The PMEL will assist to identify required equipment or approved sources of support. As a last resort, the PMEL may perform the calibration. The owner is responsible for any funding associated with these efforts.

USER/CONTRACT.

The User is responsible for calibration. Maintenance support will be obtained from a commercial source.

USER/PMEL.

The User is responsible for calibration. The PMEL will perform or assist in performing maintenance. The extent of PMEL maintenance is specified in the Calibration and Measurement Summary (CMS), support equipment plan or other maintenance instructions.

WUC (Work Unit Code).

Consist of five characters designed to identify system, subsystem, and component relationships within end items. WUC provides a standard method of sorting maintenance data and summarizing different levels of detail that is not applicable to all types of equipment.

SECTION 4

CALIBRATION AND MEASUREMENT SUMMARY (CMS) TOs

The following list of active Calibration and Measurement Summary (CMS) TOs is being included in this Technical Manual. A CMS is a categorical summary which identifies a systems measurement parameters and support equipment necessary to ensure the systems operational readiness. The summary describes the systems calibration concept, calibration workloads within the using activity and performing work center, identification of requirements for new calibration standards, equipment locations and the need for additional 33K/L - series TO Calibration TOs.

Table 4.1 CALIBRATION MEASUREMENT SUMMARIES

TO NUMBER	SYSTEM DESCRIPTION	SYSTEM NAME/NOMENCLATURE	RESPONSIBLE ALC
1A-10A-37	A-10A	Thunderbolt II	AG
1B-1B-37	B-1B	Lancer	AG
1B-2A-37	B-2A	Spirit	AG
1C-17A-37	C-17	Globemaster III	AG
1E-3A-37	E-3A	AWACS	AG
1F-15A-37	F-15	Eagle	AG
1F-16A-37	F-16	Fighting Falcon	AG
1F-22A-37	F-22	Raptor	AG
1V-22(C)B-37	CV-22	OSPREY	AG
31P1-2FPS133-42	AN/FPS-133	AFSSS (Air Force Space Surveillance System)	AG
11F1-AAQ13-12	AN/AAQ-13 & AN/AAQ-14	LANTIRN	AG
11F1-AAQ33-12	AN/AAQ-33	Sniper Advanced Targeting POD	AG
2J-1-105	Jet Engines	Jet Engine Systems (Turbo- Prop/Turbo-Shaft/Turbo-Jet)	AG
21M-AGM86-27	AGM-86A	ALCM	AG
21-AG129-27	AGM-129	ACM	AG
33K-1-11	Ballistic Missiles	Ballistic Missile Systems	AG
33K-1-53	F/EF-111A/E	Electronic Warfare A/C	AG
33K-1-53-1	F/FB-111 ()	Fighter/Bomber A/C (Depot)	AG
33K-1-53-2	FB-111	Fighter/Bomber A/C	AG
33K-1-53-3	F-111D	Fighter A/C	AG
33K-1-71	AEDC	Arnold Engineering Development Center	AG
33K-1-72	AFRL	Air Force Research Laboratories	AG

SECTION 5

RESERVED

SECTION 6

RESERVED

SECTION 7

AIR FORCE CALIBRATION AUTHORITY VIEWER (AFCAV)

7.1 PURPOSE.

This section defines the use of AFCAV for viewing the information contained in TO 33K-1-100-2 and the individual Calibration Measurement Summary (CMS) TOs. Developed by 562 CBSG, AFCAV is the official viewer for the data contained in these TOs. It also provides ad-hoc reporting capability and methods for applying periodic updates in the form of TO revisions and updates. Each of these TOs is distributed on CD and each CD contains the AFCAV setup program. Users must install AFCAV on their computer in order to use it.

7.2 DISTRIBUTION METHOD.

AFCAV maintains current TO 33K-1-100-2 and CMS data by relying on database imports and/or overwrites to apply TO revisions and downloadable update files to apply TO updates. Complete instructions for applying TO revisions and updates are contained in the accompanying HELP file. A brief summary follows:

- a. TO Revisions: 562 CBSG releases revisions of TO. 33K-1-100-2 and CMS TO on CD as required (approximately every six months). When Users receive one of these TOs, they must import the data into their AFCAV database. If the TO already exists in the User's database, AFCAV performs a Database Overwrite from the CD. This process completely replaces all data pertaining to that TO in the User's AFCAV database with the data from the new TO on the CD thereby applying the TO revision. If the TO does not exist, AFCAV simply imports the new TO.
- b. TO Updates: 562 CBSG releases updates in the form of encrypted update files. These files are normally released on a monthly basis. The update files contain changes that have occurred since the last revision or update was released. All released update files must be applied sequentially. In addition, update files released after a TO revision cannot be applied to AFCAV until that TO revision has been applied. Refer to the Who to Contact section in the AFCAV Help file for download locations.
- c. Verifying TO Dates: Refer to the TO Indexes to verify the most current TO is contained in AFCAV. A list of source document dates can be viewed in AFCAV from the Help→About AFCAV menu (see Figure 7.1). The date reflected will be the date of the last applied TO revision or update.

7.3 SPECIFICATION DATA.

AFCAV displays the TMDE specifications identified in TO 33K-1-100-2 and CMS technical orders. The *Specifications* data field identifies the Specification Type, as TABLE 1, INFO, or N/A.

- a) TABLE 1: Indicates the specifications shall be used by the calibration laboratory as the Air Force calibration performance specifications/requirements (i.e. Table 1) during calibration of the equipment item IAW the listed calibration authority.
- b) INFO: Indicates the specifications are provided for informational purposes only. (Specifications contained in Table 1 of a published 33K series TO will take precedence in the event of any conflict between these informational specifications (INFO) and specifications in Table 1 of a published 33K series calibration TO.)
- c) N/A: Indicates specifications have not yet been posted.

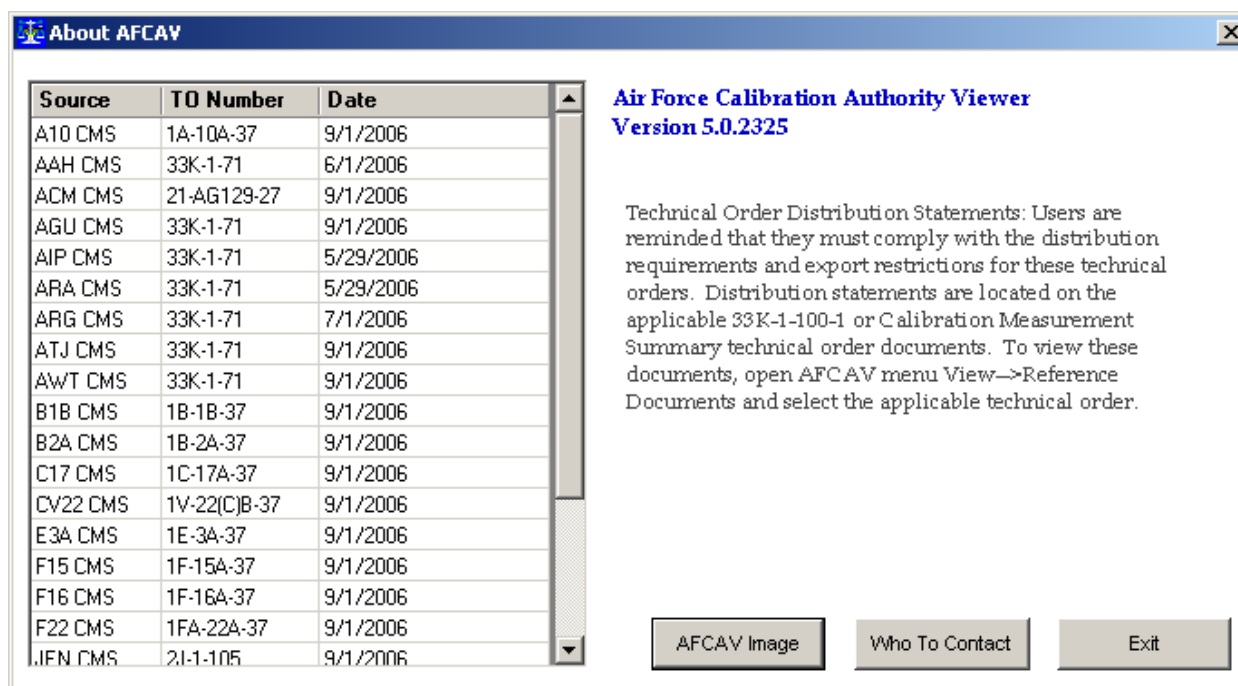


Figure 7.1 AFCAV About Screen

SECTION 8

AUTOMATED CALIBRATION TECHNICAL ORDERS

8.1 GENERAL.

Some automated calibration software procedures are capable of providing complete support for TMDE calibration. These procedures are assigned TO numbers and are managed under the TO system. These TOs will contain a “-10” suffix to indicate they are automated procedures, i.e., 33Kx-x-x-10. The Automated Calibration TO is listed in the “Auto CTO” field of TO 33K-1-100-2. For selected TMDE, both a Manual Calibration TO and an alternate Automated Calibration TO exist. If the calibration TCM has determined that an Automated Calibration TO is equivalent to the Manual Calibration TO, both TOs will be listed in TO 33K-1-100-2 and either calibration procedure may be used with equal authority and precedence as the calibration authority for the TMDE calibration. Both the manual and automated TO will be listed in the TO Index but may have different publication dates since some changes may not apply to both TOs. See Figure 8.1 for an example of an AFCAV listing showing Manual and Automated Calibration TOs.

8.2 MULTIPLE MEASUREMENT DISCIPLINE TOs.

Automated Calibration TOs that support TMDE calibrations for multiple measurement areas (K3, K4, K6, etc.) are assigned “33K10” TO numbers. If a 33K10 TO contains selectable sub procedures, and a specific sub procedure is used to support the specific TMDE part number, the Auto CTO field will contain the TO number followed by a colon and the sub procedure identifier, i.e., 33K10-4-1-10:AF1041, where 33K10-4-1-10 is the TO number and AF1041 is a sub procedure which supports the 8662A Signal Generator. The TO Index listing will identify the latest release of TO 33K10-4-1-10 but will not list the sub procedures. If there is no specific overriding direction in the Automated Calibration TO, the AUTHORITY block on the Certification Label shall include the entire Auto CTO entry, including the sub procedure identifier (in this example, 33K10-4-1-10:AF1041 is the Auto CTO and would be entered in the AUTHORITY block on the Certification Label for the Automated Calibration of the Signal Generator).

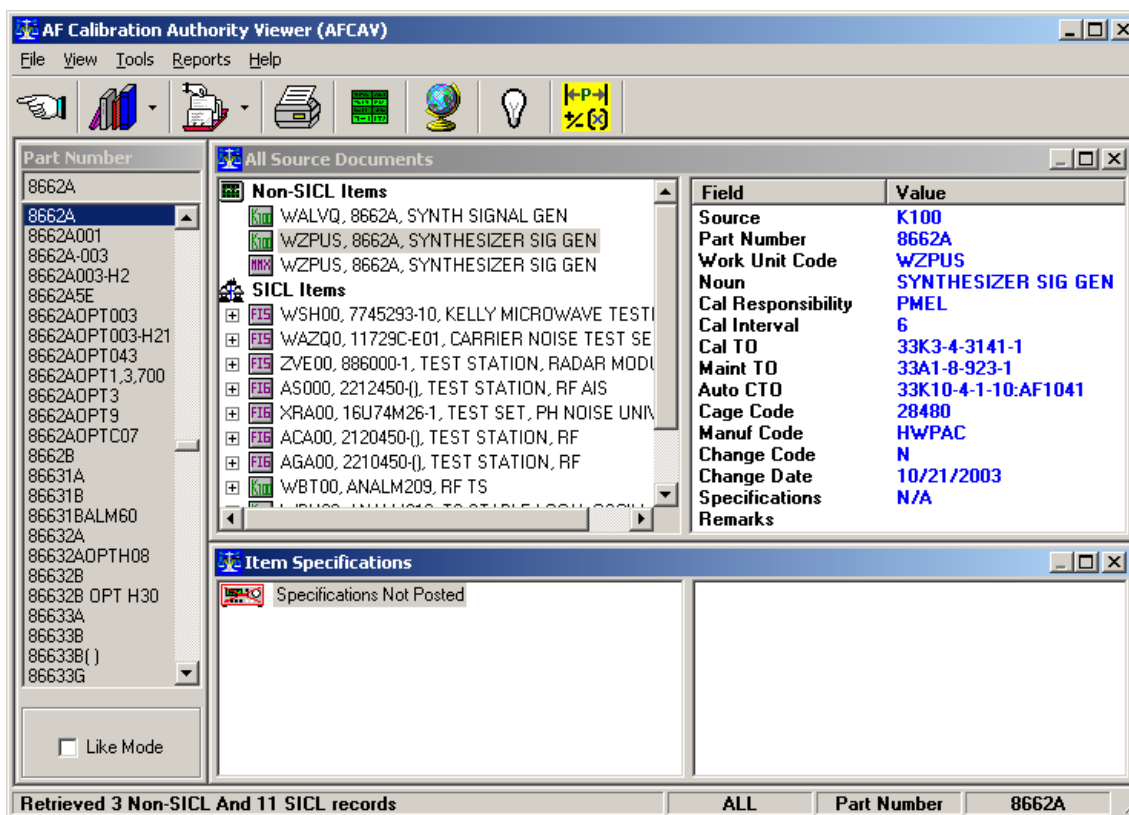


Figure 8.1 AFCAV Automated Calibration TO Listing

APPENDIX A

***GUIDANCE FOR DOCUMENTING THE PROPER ACTION TAKEN,
CALIBRATION RECEIVED AND CALIBRATION RETURN CODE***

ACTION TAKEN MATRIX			ACTION TAKEN MATRIX		
Action Taken Code	Calibration Condition Received Code	Calibration Condition Returned Code	Action Taken Code	Calibration Condition Received Code	Calibration Condition Returned Code
0	Does Not Apply	Does Not Apply	J	E	K
1	Does Not Apply	Does Not Apply	J	A	K
2	Does Not Apply	Does Not Apply	K	B	G
3	Does Not Apply	Does Not Apply	K	B	K
4	Does Not Apply	Does Not Apply	K	E	G
5	Does Not Apply	Does Not Apply	K	E	K
6	Does Not Apply	Does Not Apply	K	F	G
7	Does Not Apply	Does Not Apply	K	F	K
8	Does Not Apply	Does Not Apply	K	A	K
9	B	L	K	A	G
9	E	L	M	A	L
9	F	L	M	B	L
A	F	L	M	E	L
B	E	L	M	F	L
B	F	L	S	Does Not Apply	Does Not Apply
C	Does Not Apply	Does Not Apply	V	A	G
D	Does Not Apply	Does Not Apply	V	A	K
E	A	L	V	E	G
E	F	L	V	E	K
F	A	G	V	E	L
F	A	K	V	F	G
F	B	G	V	F	K
F	B	K	V	F	L
F	E	G	W	A	G
F	E	K	W	B	G
F	F	G	W	B	L
F	F	K	W	B	K
F	F	L	W	E	G
F	A	L	W	E	K
F	B	L	W	E	L
F	E	L	W	F	G
J	A	G	W	F	K
J	E	G	W	F	L
J	F	G	X	Does Not Apply	Does Not Apply
			Y	Does Not Apply	Does Not Apply